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ABSTRACT

We must search for greater productivity in the teaching and learning process. During the past 15 years expenditures for elementary and secondary education have climbed from about four percent of GNP to eight percent. Much of this expenditure has been for educational technology, but we still don't know enough about how to use it. To help make better use of this technology the Office of Education has changed some of its research priorities, and has created a new unit, the National Center for Educational Technology (NCET). NCET will help to make the focus of our educational technology research more specific, to stop nickel-and-diming a lot of small studies and to start investing in a few comprehensive projects. For example the Rocky Mountain Demonstration Project has been awarded $5 million, half of NCET's fiscal 1973 budget, to try to show that some of the promises of educational technology can be realized. And we want to show that in the rush to efficiency and productivity we don't have to lose our sense of humanity. (MG)

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FEDERAL POLICY AND EDUCATIONAL TECHNOLOGY*

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There is no more fundamental issue in the political and professional affairs of education in America at this time than the problems of how to pay for the kind of education at all levels that Americans demand. We are deeply engaged at local, State and federal levels in the anxious and urgent search for more resources and new revenue structures. More money is part of the answer. But it is not the only answer. We are forced now to search with equal urgency for greater productivity in the teaching and learning process. Productivity is a bitter and dangerous word in my profession. But the time has come for us to use it, straightforwardly, non-apologetically, and immediately. Productivity means the application of devices in our labor-intensive teaching art in ways that will produce as good or better results at a lower unit cost. The wisest leaders of the organizations of teachers know this. They know that if they truly are to follow the letter and spirit of the labor movement, the time comes when productivity comes to the bargaining table. And with it came the subject assigned to me today, educational technology.

I recall a conversation I once had with a neurosurgeon about the difficulties of accurately diagnosing a patient's ailment. "You know," he said, "our knowledge of the brain has grown enormously during this century. Not too many years ago, we

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thought we had about 50 percent of the brain's functioning pretty well figured out. Today, I would say we possess some certainty concerning 10 to 15 percent of its functions."

My friend's point -- that a quantum gain in knowledge often teaches us how little we truly know -- has relevance to problems we face today in putting technology into proper use in American education.

During the past 15 years, the expenditures for elementary and secondary education have moved from about four percent of our GNP to the current eight percent. Most of us in education feel good about this. But we also know that there is a ceiling. The issue of cost-benefit seem now to be upon us as social policy and political reality come face to face. There are many good reasons for examining educational technology. This is one.

Never have we known so much about the <u>things</u> of educational technology, with no apparent end to data on computers, audio-visual devices, television, simulation exercises, programmed instruction, and instructional development systems. Unfortunately, we're not at all certain as to how these things fit into place. All this material has not taught us what we really want to know about how technology, in all its myriad forms, can best be applied in the service of education. The increasing debate over the whole business of technology for education reflects this general state of uncertainty: It works. . .it doesn't work. . .it makes no significant difference in pupil achievement. . .it frees the pupil. . .it dehumanizes the classroom. Arguments ebb and flow

on all sides of the question.

In a fine book called Who Pushed Humpty Dumpty, for example, Donald Barr has this to say about programmed instruction -- once one of the brightest stars in the educational technology firmament: "That there is a use for programmed instruction, and an important use, I do not dispute. It is admirable for the training of inventory clerks, of detail men for pharmaceutical houses, of assembly-line technicians. But let us not call the damned thing education."

Well, what about educational technology? Is the damned thing education? No, of course not, not all of education. But is it an important process of education? Emphatically, yes.

When I joined the U.S. Office of Education about a year and a half ago my own experience as a teacher, administrator, and active participant in what has come to be known as the "learning industry," had convinced me of the strong and necessary relationship between education and technology. I was further convinced that if our schools were to do more than merely survive the manifold challenges of the 70's and the decades to come, then the search for the relationship between these two powerful forces had to be pressed with a spirit of high urgency. I felt then, as I do now, that technology must be employed as an agent of reform by educational and political leadership at every level of government if the great issues in education -- finance, control, curricular relevance, student alienation, equal educational opportunity, and public confidence -- are to be resolved in ways that strengthen rather than weaken

the essential humaneness of the teaching art.

A few years ago, during what we mistakenly thought of as "the educational technology decade" of the 1960's, it was widely predicted that technology was on the verge of fostering a learning revolution that would remake the face of education. It didn't happen, of course, and today, older and wiser, we understand that the change effected by technology in the educational process is evolutionary rather than revolutionary. But it is change nevertheless -- a profound and pervasive change, and a change that is, I would say, proceeding at an accelerating pace due to the commitment of groups such as the Education Commission of the States and certainly due to the lively conviction of the present Administration. A major element of the President's 1972 State of the Union message concerned the need for the application of technology to the solution of major social problems and to ensure the general advance of our civilization. The President has also said that "our goal must be to increase use of the television medium and other technological devices to stimulate the desire to learn and to help teach. The technology," he added, "is here but we have not learned how to employ it to our full advantage."

Today, I would like to attempt to put into perspective the steps we at the Office of Education are and will be taking to carry out the President's intentions. We are charting a course of support and development of technology that has as its starting point the rapid establishment of a coherent, forward-looking

Federal policy to serve as the basis for the crucial decisions that will surely have to be made in the coming years. The need to install such a policy structure is urgent.

OE has, of course, been a major source for the support, development, and demonstration of technology. In 1967 alone, it is estimated the Office supplied more than $600 million in support of technology-oriented instructional materials, media, and media-based activities. From fiscal year 1965 through the beginning of fiscal 1971 the Office awarded over $160 million for more than 500 R&D projects involving computers in every conceivable way -- tutorial presentations, problem solving, gaming simulation, testing, vocational guidance, instructional management, data analysis, information storage and retrival, library services, and school administration.

But all these activities, as well as those in related areas such as training and research, though individually useful, cannot be said to have achieved the maximum cumulative results that could have been hoped for. And no coherent body of knowledge concerning the overall usefulness of computers in education has been developed as a consequence of OE support for these projects. This support was part of a Federal response to particular educational problems rather than for the more sweeping purpose of building a systematic body knowledge in the field, with corresponding objectives of productivity. The use of computers was incidental to the basic educational objective of each project, whether it was educational diagnosis and prescription, improved administration,

or whatever. Drawing upon resources scattered throughout the more than 100 different statutory programs administered by OE, we have helped a project here and a project there, a college here or a school system there. Unfortunately, this method of doing business has not led to the design and fulfillment of an overall strategy of technological innovation to an extent commensurate with our investment, or to a degree compatible with the leadership role that rightly should be expected of the national government.

We have moved to correct this situation by giving educational technology organizational status within OE consistent with its importance. We have established a National Center for Educational Technology as a major OE unit, effective this spring. This called for the separation of Educational Technology from its reluctant parent, the Bureau of Libraries.

This represents more, I hope, than mere symbolic shifting alphabet blocks on a many-armed organizational chart. I believe that the National Center for Educational Technology can be the vibrant point of contact between the Federal Government and the many problem areas throughout education for which technology should be able to provide workable solutions. Specifically we see NCET as having three major purposes: First, it would administer all funds specified under a technology budget request for the support of the development validation and application of technology; second, NCET would coordinate all OE educational technology activities such as the support for new kinds of teaching devices sponsored by our Bureau of Education for the Handicapped for example, and the many technologically oriented projects mounted

by our Bureau of Adult, Vocational, and Technical Education. In other words, NCET will be a central source of knowledge and expertise concerning the total range of OE-sponsored technology-for-education activities; third, NCET would serve as a true national focus for educational technology, defining public issues, encouraging States and localities to apply to their own situations the benefits of computers, television, and other forms of telecommunications as created, researched and validated by the National Institute of Education, Education Commission of the States, and other agencies and organizations. Not least of the relationships to be fostered by the new Bureau will be the vital partnership with the commercial and industrial producers.

For Fiscal Year 1973 we have asked Congress to provide NCET with a $30 million budget, about double this year's, of which $20 million is spoken for, including $13 million for our Educational Broadcasting Facilities Program --- which has made a major contribution in expanding the number of non-commercial television stations in operation; --- and $7 million to support the Children's Television Workshop efforts with Sesame Street and The Electric Company, the same level as this year. The remaining $10 million will be used for large-scale demonstrations of the use of modern educational technology, including television, computers, teaching machines, and other labor saving devices.

Past OE efforts to apply technology to improve education too often led to the provision of partial support for equipment but not for programs and materials; for training but not equipment; for materials development but not validation. NCET, however,

will sponsor projects that are responsive to a single, integrated strategy incorporating planning, facilities selection and installation, materials and program design, staff training, and structured demonstrations of educational technology systems in operation.

Among the first large-scale demonstration projects NCET has had a hand in is one which also involves the Education Commission of the States. I am speaking, of course, of the Rocky Mountain Satellite Demonstration Project, an historic attempt to test the effectiveness of satellite-based educational telecommunications.

For years we have predicted a major role in education for satellite communications systems because of their ability to transmit information to populations scattered across large portions of the earth's surface without reliance on ground systems. Events of the last year or so--especially NASA's agreement to place into orbit for purposes of both domestic and international experimentation a highly sophisticated satellite known as ATS-F -- have hastened the future to next spring.

A word about this piece of hardware, for it represents a revolutionary advance in satellite communications when compared to earlier versions at the ATS series. While many earlier satellites require ground receiving equipment costing from $1 million to $4 million, ATS-F's powerful transmitting apparatus will provide television signals receivable by relatively uncomplicated, easy-to-install antennas and down converters costing under $1,000. The equipment, still at a relatively modest cost, permits two-way audio. It will be able to handle telephone, telegraph, radio,

television, facsimile, and computer data services and spot beam its transmissions to specific target areas on two or three minutes notice. It can receive as well as send transmissions, making two-way communications possible. Poised in what is called "synchronous orbit," it can cover as the earth turns the entire U.S., and the four audio channels associated with each of the satellite's two video channels enables simultaneous broadcast in several languages with the user having the option of which to tune in on -- a matter of some importance in the Rocky Mountain area, with its large number of Spanish-Americans and American Indians. About the only thing this monster can't do is coach the high school football team, and I suspect NASA is working on that.

ATS-F is without question a wonderfully versatile communications tool. But how well it performs in education is squarely up to us -- ECS, OE, the Federation of Rocky Mountain States, the Western Interstate Commission on Higher Education, State education departments, the Corporation for Public Broadcasting, those groups in Alaska and Appalachia who are engaged in planning to receive the signal, and the other organizations and groups who will be involved. Of the 20 different public service, user-oriented experiments NASA has scheduled for ATS-F, ranging from health communications to safer aircraft operations, I feel certain the educational program offers the most complex challenge to those responsible for its ultimate conduct.

With this in mind we have attempted to focus our effort in the Rocky Mountains on programs to improve learning in two areas,

early childhood development and career education--two very high priorities of OE. In addition to curricular development by ECS and others, we are sponsoring research into engineering requirements essential to the experiment and support a program to train teachers in the use of these new communications services. We have also asked a team of educational researchers from Stanford's Department of Communications to help us evaluate progress of the experiment. We are channeling $5 million -- half our entire educational technology demonstration budget for Fiscal Year 1973 --- into this satellite demonstrations. This is an expression of our commitment to stop nickel-and-diming the field of technology with small grants to scholars and institutions, but to try to target our resources in depth in reach of that elusive breakthrough.

We are doing some other things to improve the delivery of educational services to areas of great cultural and geographic isolation. We have asked both the Appalachian Regional Commission and the State of Alaska to come up with ways their telecommunciations requirements might be met by ATS-F. In Appalachia the satellite will be a linking device, tying ground-based communications services together to improve in-service training to educational professionals. In Alaska a satellite now in use for an experiment linking 21 native villages in radio communication might use ATS-F to televise locally produced programs, national curricula such as Sesame Street and The Electric Company, and even, if appropriate, the instructional programs ECS is developing for the Rocky Mountains.

We are determined, in short, not to let opportunities in the fast-developing telecommunications field slip by. Given the range

and flexibility of today's satellites and related advances in cable television, convenient TV cartridge and disc systems, and computers, I dream of the day when we will see computers, cable and broadcast TV, radio tapes, and,--yes, books and chalk boards and good teachers hooked together into a high-quality, low-cost educational system capable of bringing the best, the very best -- through technology-- to every student.

Cost and politics, of course, will determine how quickly this vision comes to pass. Cost is not an insuperable barrier. As Sesame Street with its per-pupil cost of $1.29 per year has shown us, high start-up costs do not necessarily price a learning product out of today's educational market. Politics is a stickier wicket. Jurisdiction, content, time of delivery, methods of delivery, legitimate questions about Federal control --- these are the issues that are bound to crop up in any broad-ranging educational communications system, and their solution will depend on governmental and organizational cooperation. I am sure ECS, with its solid record of accomplishment in bringing States together in the cause of education, is alert to the constructive role it might play in achieving equitable solutions to these problems as they emerge.

Beyond costs and politics, technology's big problem will be, quality. Again, this is an area where I believe increased leadership and support must come from the Federal level. Sesame Street, The Electric Company, and the lesser known but highly effective Patterns in Arithmetic can be counted, even acknowledging the critics, as shining successes. Federal aid in general, however, has been much more successful in helping our schools to stock new

hardware than in stimulating production of validated, lively materials to fill the machines. We obviously need better educational software. Materials and processes lying in the immediate future of NIE and the National Center for Educational Technology will reflect this necessity.

Several recent funding actions help to illustrate our determination to sponsor the systematic development of sound broad based educational programs, and especially to build upon the success of Sesame Street. We have, for example, just awarded $300,000 to Gulf Region Educational Television Affiliates for a tri-ethnic television series aimed at improving language skills and cultural understanding among Anglo, Black, and Chicano pre-schoolers in the Houston area. The series will be broadcast in both Spanish and English, 260 half-hour programs for children as well as weekly shows for parents in an area serving four million people. Tapes of the shows will be distributed to commercial and non-commercial television outlets around the country to reach the widest possible audience, especially those audiences with Spanish interests.

Another $800,000 was awarded to the Berkeley, California, Unified School District in March for a television series for Spanish-speaking pre-schoolers. A few years ago, we might have tried to spread this sum over 80 school districts at 10,000 apiece with little outcome. We are trying to target our limited resources in depth. The need is obvious. Spanish-speaking Americans, our second largest minority, average only eight years of schooling and, in many regions of our land, suffer achievement gaps of up to six

years, after entering school with little or no English. The creators of this experimental program plan to draw heavily on the experience of successful children's series such as Sesame Street in developing approaches that will entertain as well as instruct their youthful audiences.

In another TV project, we have asked Fred Rogers, of Mr. Rogers' Neighborhood, to explore using television to educate parents on the needs of children from birth through age six. The Coleman study gives us much good counsel on the need for providing a stable house environment for children as a condition of effective learning. We believe Mr. Rogers' work may well turn out to be as important as the initial research readings submitted by the Children's Television Workshop in its investigation of television for reaching and teaching children. At least that's what we're hoping.

In closing, I would say that I have no real doubts that technology will eventually succeed in education. But I would suggest that we must think very hard about the kind of success we are seeking. What concerns me is the rather frightening possibility, and I am certainly not the first to perceive it, that in our rush to efficiency we will lose our humanity; that in our desire to cut the cost of education and increase productivity, we will lose sight of the primary purpose of education, which must always be to confer upon our students above all else a sense of humanity, a sense of the oneness of all mankind --- a sense of communion between teacher and learner.

I do not agree with all that Charles Silberman says, but he is

correct when he asserts that a mechanically minded approach to educational technology is likely to "compound what is most wrong with American education --- its failure to develop sensitive, autonomous, thinking, humane individuals." And these qualities, perhaps to our good fortune, can never be reduced to computer "bits" and can never be enshrined in the most sophisticated computer memory. Thinking is painful and learning how to think is difficult, and education, whether computer-assisted or not, whether conveyed on a television screen or bounced off a satellite, must be fashioned to the individual's very personal thought process --- if it is truly to be education and not some lesser form of information transferral.

Tom James, formerly Dean of Stanford's School of Education, expressed his reservations about educational technology in this way: "The developing technologies for education" he writes, "must display more humility and more imagination than they have thus far --- for on the one hand, the micro-efforts to transmit bits of facts ignore the great sweep of humane experience to which the teacher in the past and the technologies developed in the future can only be window-openers; and on the other hand, the technologies emerging can through the use of multi-media give wings to the human mind in ways that are yet to be devised in helping man to encompass his environment."

As Dean James suggests, the future of education will be determined not so much by the strictly scientific capacities of the United States --- we know they are awesome --- but by the imaginative and humane uses to which we put those capacities.

I think we have good reason to be modest in our claims, and to shun excessive expectations of our machines, as we press hard toward our objective of making technology the instrument of the teacher and the servant of education. But, if we do either in a flash of bright light, or in the labored inch by inch process of evolution come upon the breakthroughs that truly speak to productivity in teaching, will we have the vision, the will and political courage to put them in place, and reap the corresponding economies? The answers lie in this room.

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